

# PATENT SPECIFICATION

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## COMPLETE SPECIFICATION

### Improvements in or relating to Impression Taking Compositions

We, DENTAL PERFECTION COMPANY, a corporation organised under the laws of the State of California, United States of America, of 543, West Arden Avenue, Glendale 3, California, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to improvements in impression taking compositions useable to produce a plaster cast, and is directed particularly to advances in dental impression materials of the general type comprising a gel-forming component, and a metallic salt component reactive therewith in aqueous solution to produce an insoluble gel in a surface of which is formed the impression against which a plaster (usually plaster of Paris) casting material is poured. As will appear, the invention is concerned primarily with so conditioning the impression-forming material as to assure the formation of a desirably hard plaster surface at the impression-cast interface.

The present invention provides an impression taking composition comprising a gel-forming component or a mixture of gel-forming component of the group consisting of a water soluble alginate, a gellable pectin material and sodium, potassium or ammonium carboxy methyl cellulose, a metallic salt component, e.g. calcium sulphate, reactive with said gel-forming component or mixture in solution to form an elastic gel in a surface of which may be formed an impression against which a plaster casting material may be poured, and zinc fluoride uniformly distributed within the composition and operable therewith to cause formation of a hard and smooth plaster surface at the impression-cast interface.

This type of impression material may employ any of various gel-forming agents of the group, consisting of sodium, potassium and ammonium alginates, the pectin and pectate-derived gellable substances including the alkali metal pectin compounds, also sodium, potassium or ammonium carboxy methyl cellulose. For purposes of the present inven-

tion the sodium and potassium alginates, or mixtures thereof, may be regarded as preferred, but in its broad aspects the invention contemplates the use of any of these gelling agents, or mixtures thereof, which are combinable with a metal ion under controllable conditions to form an elastic gel capable of accurately reproducing the subjects to be cast.

Useable compounds of metallic ions reactive with the gelling agent are the calcium sulphates, i.e. the decahydrate, dihydrate and hemi-hydrate. Among these, the hemi-hydrate is preferred. Also useable with calcium sulphate individually or in mixtures thereof, are lead salts including lead monosilicate, lead disilicate, basic lead sulphate, basic lead carbonate and other lead salts, also salts of other metals including zinc, strontium, etc. Only in certain specific aspects is the invention concerned with the particular metal or combination of metals used.

In order to retard the reactions between gel-forming components and metallic salts retarders are commonly used. These retarders include the alkali metal carbonates, notably sodium carbonate and the alkali metal phosphates and polyphosphates, e.g. tri-sodium phosphate and sodium polyphosphates, e.g. sodium meta, ortho and pyrophosphates. Also useable as the retarder may be the metal (e.g. alkali earth metal) salts of substituted acids of ethylene diamine described in the Specification of United States Patent No. 2,657,971. This patent teaches the use of alkali metal salts (e.g. sodium or potassium) of a tetracarboxy acid of ethylene diamine as a retarder in impression-taking materials which may employ gel-forming agents having acid radicals of the group selected from alginic, pectic and carboxy methyl cellulose acids, and inorganic salt components consisting of calcium and lead salts. In embodiments of the present invention any of these retarders or mixtures thereof may be used in accordance with the requirements of any particular impression material.

The impression material may also include any appropriate filler such as powdered talc, clay, diatomaceous earth, calcium carbonate,

silica and the like, all of which are relatively inert.

The invention is concerned with the incorporation in the impression material of a constituent that will assure desirably hard and smooth surface setting of the plaster casting material at the impression-cast interface. It may be mentioned in this connection that the general procedure followed in making the so-called stone cast, is to pour plastic plaster of Paris against the impression and to allow the cast to harden and set in contact therewith. Now it is found that many impression compositions so inhibit or interfere with proper setting of the plaster that the plaster surfaces in contact with the impression will not set with the necessary smoothness and hardness, and consequently the cast either will lack durability or accuracy because of the impositive set of those surfaces definitive of the impression. One practice used to obviate this condition has been to prepare a separate fixing solution into which the impression is dipped before application of the plaster, a sufficient amount of the fixing solution adhering to the interface impression surface to produce hardening of the plaster.

It is now known, but for reasons that may not be fully understood, that certain fluosilicates and fluorides, e.g. the alkali metal fluosilicates and alkali metal fluorides, have the effect when included in small percentages within the impression taking composition, of causing or permitting the plaster to set against the impression material gel with formation of a hard plaster surface at the interface. However, it is found that this property is not common to all fluorides, or metallic fluorides, and that in the case of the metallic fluorides ( $\text{XF}_n$ —where X is a metal) all are not practicably operable and their workability for the purposes of the invention cannot be predicted.

We have discovered that zinc fluoride,  $\text{ZnF}_2$ , in impression materials containing a metallic salt possesses effective and heretofore unknown and unpredictable properties, when it is used in small amounts, (say between about 0.10 parts to 2.0 parts by weight), in the present impressions taking compositions of causing or enabling the stone to set and form against the impression a hard and accurately reproducing surface. The preferred fluoride content is 0.1 to 2.0 parts by weight in 100 parts of the complete impression material composition.

Zinc fluoride is also found to serve as an effective promoter of the reaction between the gel-forming component and calcium sulphate hemi-hydrate, when a phosphate or polyphosphate is used as a retarder. ("Retarder", as herein used, has the usual connotation of a compound which acts by sequestration of the metallic ions, in the reactive salt component,

to control the rate of gellation of the e.g. alginate). It is found that in an impression-taking composition containing a gel-forming agent, typically an alkali metal alginate, and calcium sulphate hemi-hydrate with or without the presence of a lead compound such as lead monosilicate, the reaction between the alginate and metallic ion or ions will progress satisfactorily and at a rate properly controllable by an alkali metal phosphate or polyphosphate in the presence of zinc fluoride.

The following is a typical impression-taking material compound in accordance with the invention:—

72 gm. alkali metal alginate  
220 gm. diatomaceous earth (filler)  
7 gm. tetrasodium pyrophosphate (retarder)  
40 gm. calcium sulphate hemi-hydrate

To the above composition was added 0.5 gm. of zinc fluoride.

When mixed with water at 70° F., the material congealed in 2½ minutes and set at 4 minutes.

Plaster of Paris poured against an impression formed in a surface of the gel, set with the formation of a properly hard surface at the interface.

What we claim is:—

1. An impression taking composition comprising a gel-forming component or a mixture of gel-forming components of the group consisting of a water soluble alginate, a gellable pectin material, and sodium, potassium, or ammonium carboxy methyl cellulose, a metallic salt component, e.g. calcium sulphate, reactive with said gel-forming component or mixture in solution to form an elastic gel in a surface of which may be formed an impression against which a plaster casting material may be poured, and zinc fluoride uniformly distributed within the composition and operable therewith to cause formation of a hard and smooth plaster surface at the impression-cast interface.

2. A composition as defined in claim 1, in which the gel-forming component is an alkali metal alginate.

3. A composition as defined in claim 1 or 2, in which the metallic salt component contains lead ions reactive with the gel-forming agent.

4. A composition as defined in claim 1 or 2, containing also as a retarder, an alkali metal carbonate, phosphate or polyphosphate.

5. A composition as defined in claim 4 containing also a filler, and in which the metallic salt component comprises calcium sulphate hemi-hydrate.

6. A composition for taking an impression substantially as herein described.

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